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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ROSS, JOHN M

ART UNIT

PAPER NUMBER

2188

DATE MAILED: 12/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/087,901

Applicant(s)

LANZATELLA ET AL.

Examiner

John M Ross

Art Unit

2188

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-18 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-18 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of Claims

1. Claims 1, 3-18 and 20 are pending in the application.

Claims 1, 3-18 and 20 are rejected.

Response to Amendment

2. Applicant's amendments and arguments filed on 21 September 2004 in response to the office action mailed on 17 June 2004 have been fully considered, but they are not persuasive. Therefore, the rejections made in the previous office action are maintained and restated below.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3-13, 15, 18 and 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Cabrera (US 6,708,227) in view of Cochran(1) (US 6,718,447), Cochran(2) (US 6,721,902) and Principia Cybernetic Web (PCW) ("Decision Theory", http://web.archive.org/web/20000229130444/http://pespmc1.vub.ac.be/ASC/DECISI_THEOR.html, Feb. 2000).

Cabrera teaches a method for producing point-in-time copies (i.e. snapshots) of objects wherein an application programming interface (API) coordinates multiple snapshot providers, thereby providing a standardized protocol for backup applications (Column 2, line 48 to column 3, line 61; column 4, line 30 to column 5, line 61).

As in claim 1, Cabrera teaches that a backup application transmits data to the API identifying a storage object (Fig. 7; column 9, lines 17-25).

Cabrera does not teach that the API returns a list of methods appropriate for making the snapshot, where each method includes a measure of quiesce strength as required by claim 1, however it is readily apparent that Cabrera describes a heterogeneous storage environment where different combinations of service providers can be used to generate a snapshot of an object (Column 3, lines 13-32; column 5, lines 19-35), where it is noted that Cabrera teaches that a service provider may be present anywhere in the software/hardware stack, and that quiesce operations are performed by the service providers as an integral part of the snapshot process (Column 5, line 32-40; column 9, lines 55-66).

Cochran(1) teaches a method for making snapshots where an application program exploits the hardware snapshot capability of a disk controller (Column 3, line 62 to column 4, line 10). Cochran(1) further teaches that such an arrangement may result in transactional inconsistency between the primary and backup storage objects (Column 4, lines 11-32), where it

is understood that a quiesce operation in a mirror split snapshot method comprises obtaining logical consistency between the primary and backup storage object.

Cochran(2) likewise teaches that transactional inconsistency is likely to result when using a hardware mirror split snapshot method due to the inability to reliably quiesce the primary and backup storage objects (Column 4, line 57 to column 5, line 7). Cochran(2) advances a solution involving the use of a locking mechanism (Column 5, lines 17-40). A skilled practitioner of the art would recognize that the introduction of a semaphore as in Cochran(2) also introduces the potential for deadlocks.

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to apply the teachings of Cochran(1,2), in the system of Cabrera, due to the similar nature of the problems. Cabrera teaches methods for coordinating multiple heterogeneous snapshot services at all levels of the software/hardware stack. The teachings of Cochran(1,2) are directed toward snapshot services residing in hardware. Therefore, one skilled in the art would expect the potential for transactional inconsistency and deadlocks to be present in the system of Cabrera, and that such potential would depend upon the particular combination of service providers used in making the snapshot, thereby making the use of certain combinations more likely to result in undesired behavior.

PCW teaches a theory of decision making where a decision maker chooses among a set of alternatives in light of their possible consequences, where alternatives are associated with

Art Unit: 2188

consequences having a known probability of occurrence (i.e. decision under risk). In other words, PCW teaches that alternatives may be ranked according to a risk associated with the alternative so that an informed decision may be made about which alternative to choose.

Regarding claim 1, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant, to apply the decision theory of PCW, in the system made obvious by the combination of Cabrera and Cochran(1,2), such that the risk of transactional inconsistency and deadlocks associated with particular combinations of service providers used in making a snapshot is reflected in a quiesce strength (i.e. risk ranking), in order to make an informed decision about which alternative to choose as taught by PCW.

Further regarding claim 1, it would have been obvious to provide such information as a return value from the API of Cabrera, as such teachings are well known in the art for the purpose of interaction between applications and underlying processes managed by an API, noting that the possible alternatives would comprise a list of snapshot methods.

Claim 3 is rejected using the same rationale as for the rejection of claim 1 above.

Claim 4 is rejected using the same rationale as for the rejection of claim 1 above, noting that in PCW a selection is made and in Cabrera a snapshot method is executed.

Claim 5 is rejected using the same rationale as for the rejection of claim 4, noting that PCW teaches making a selection based on the ranking of alternatives.

Claim 6 is rejected using the same rationale as for the rejection of claim 4 above.

Claim 7 is rejected using the same rationale as for the rejection of claim 4 above.

Claim 8 is rejected using the same rationale as for the rejection of claim 7 above, further noting that it is well-known in the art to pass arguments (i.e. preferences) to functions of an API in order to specify optional behavior of the function.

Claim 9 is rejected using the same rationale as for the rejection of claim 7 above.

Claim 10 is rejected using the same rationale as for the rejection of claim 8 above.

Claim 11 is rejected using the same rationale as for the rejection of claim 7 above, noting that it is readily apparent that in order to identify the storage object and snapshot methods they must have a corresponding identifier, and it is also readily apparent that the data in the list and frozen image must have a corresponding data structure.

Claim 12 is rejected using the same rationale as for the rejection of claim 11 above, noting that the storage identifier must be transferred to the API by calling the API in order to correctly identify the storage object for the snapshot, where it is understood that a call is merely an invocation of the services provided by the API.

Claims 13 and 15 are rejected using the same rationale as for the rejection of claims 11 and 12, respectively, where it is noted as above that quiescing the storage object is an integral step in obtaining a point-in-time copy.

Claims 18 and 20 are rejected using the same rationale as for the rejection of claims 1 and 3, respectively, where it is again noted as above that quiescing the storage object is an integral step in obtaining a point-in-time copy.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cabrera (US 6,708,227) in view of Cochran(1) (US 6,718,447), Cochran(2) (US 6,721,902) and Principia Cybernetic Web (PCW) ("Decision Theory", http://web.archive.org/web/20000229130444/http://pespmc1.vub.ac.be/ASC/DECISI_THEOR.html, Feb. 2000) as applied to claim 13 above, and further in view of Gregg (US 5,938,786).

Cabrera, Cochran(1,2) and PCW are relied upon for the teachings relative to claim 13 as above.

The combination of Cabrera, Cochran(1,2) and PCW does not teach the transmission of a signal upon completion of a quiesce operation as required by claim 14.

Gregg teaches a system comprising a communications handshake between two components of the system where the first component sends a signal to the second component requesting that the second component perform a quiesce operation, and the second component responds with a signal upon completion of the quiesce (Fig. 8; column 8, lines 42-50), where it is readily apparent that such a handshake maintains an orderly execution of operations in the system.

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to transmit a signal upon completion of a quiesce operation as taught by Gregg, in the system made obvious by the combination of Cabrera, Cochran(1,2) and PCW, for the purpose of maintaining an orderly execution of operations in the system.

6. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cabrera (US 6,708,227) in view of Cochran(1) (US 6,718,447), Cochran(2) (US 6,721,902), Principia Cybernetic Web (PCW) ("Decision Theory", http://web.archive.org/web/20000229130444/http://pespmc1.vub.ac.be/ASC/DECISI_THEOR.html, Feb. 2000) and Gregg (5,938,786).

Regarding claim 16, the rationale derived from Cabrera, Cochran(1,2) and PCW in the rejection of claim 13 above is incorporated herein for the teaching of a means for receiving data identifying a storage object, a means for transmitting a freeze list with one or more freeze methods appropriate for freezing the storage object, where as noted above the quiesce operations performed by the service providers are an integral part of the snapshot process.

The combination of Cabrera, Cochran(1,2) and PCW does not teach the transmission of a signal upon completion of a quiesce operation as required by claim 16.

Gregg teaches a system comprising a communications handshake between two components of the system where the first component sends a signal to the second component requesting that the second component perform a quiesce operation, and the second component responds with a signal upon completion of the quiesce (Fig. 8; column 8, lines 42-50). It is noted that such handshakes are well known in the art for the purpose of maintaining a deterministic order of operations in a system.

Regarding claim 16, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to transmit a signal upon completion of a quiesce operation as taught by Gregg, in the system made obvious by the combination of Cabrera, Cochran(1,2) and PCW, for the purpose of maintaining a deterministic order of operations in the system.

Claim 17 is rejected using the same rationale as for the rejection of claim 8 above.

Response to Arguments

7. Applicant's arguments filed 21 September 2001 with respect to the rejection of claim 1 have been fully considered but they are not persuasive.

Art Unit: 2188

Applicant asserts that the combination of Cabrera, Cochran(1), Cochran(2) and PCW does not teach particular limitations recited in claim 1 (Page 2, paragraph 3).

Examiner is not persuaded. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out supposed errors in the examiner's action and how the language of the claims patentably distinguishes them from the references.

Applicant disagrees with the examiner's conclusion that one of ordinary skill in the art would recognize the potential for transactional inconsistency and deadlock in the system of Cabrera and requests substantiation of this conclusion (Page 2, paragraph 4).

Firstly, this conclusion is reached in light of the application of Cochran(1,2) to Cabrera, as noted in the prior office action and restated above. Cabrera teaches a heterogeneous storage environment where different combinations of software/hardware service providers can be used to generate a snapshot of an object. Cochran(1,2) teaches that particular hardware snapshot mechanisms are susceptible to transactional inconsistency. Cochran(2) further teaches that a snapshot operation may comprise a semaphore (i.e. a locking mechanism). As admitted by applicant, locking mechanisms can lead to deadlocks (See lines 22-23 on page 4 of the specification).

Therefore when considering the application of Cochran(1,2) to Cabrera, as motivated by the similarity in nature of the problems between Cabrera and Cochran(1,2), namely the

Art Unit: 2188

generation of snapshots, one of ordinary skill would be compelled to conclude that a potential problem of transactional inconsistency and deadlocks would be present. Because these problems are associated with particular snapshot mechanisms, one would further be led to conclude that each unique combination of service providers selected for generation of a snapshot would result in a unique susceptibility to the potential problems associated with the particular snapshot mechanisms used by the service providers.

Applicant further asserts that there is no motivation for combining PCW with Cabrera and Cochran (1,2) (Page 2, paragraph 5 to page 3, paragraph 1).

As stated in the prior office action and restated above, the motivation to combine is: *in order to make an informed decision about which alternative to choose*. Examiner submits that choosing among a set of alternatives based on the consequences of each choice is a common occurrence in everyday experience. For example, a person may make dietary choices based on short and long-term consequences related to enjoyment and health. In fact, the sheer ubiquity of decision-making has led to its codification in Decision Theory such as that taught by PCW, which provides a general, systematic and repeatable method for arriving at a decision.

The combination of Cabrera and Cochran(1,2) shares a common problem with PCW, namely the need to select between alternatives. Therefore, presented with this problem one of ordinary skill in the art would be motivated to apply the solution of PCW to Cabrera and Cochran(1,2) in order to gain the advantages of PCW as stated above.

Applicant also disputes examiner's assertion that returning a list of values from an API is well known in the art (Page 3, paragraph 2). As evidence of this fact, applicant is referred to McMichael (US Pub 2003/0023826). McMichael teaches a storage system including an API that comprises a query function that returns a list of values (Paragraphs 63, 66 and 70). In view of Cabrera's teachings regarding the use of a query function in the API to coordinate multiple snapshot providers and applications that call the snapshot providers (Column 4, line 60 to column 5, line 2), as well as the similarity in the nature of the problems, namely to provide an API query function, one of ordinary skill in the art would be motivated to combine these teachings as stated in the rejection of claim 1 in the prior office action and restated above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

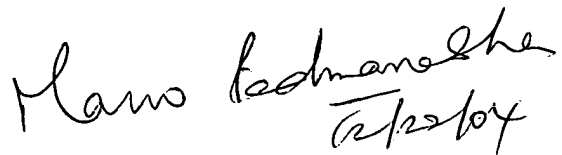
Art Unit: 2188

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M Ross whose telephone number is (571) 272-4212. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on (571) 272-4210. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


JMR



**MANO PADMANABHAN
SUPERVISORY PATENT EXAMINER**